

Claims

[c1]

1. A fault tolerant method to update a Fibre Channel database, comprising:
receiving a first message from a commit master;
detecting the loss of the commit master; and
resending the first message to each of a specified one or more devices if the first message or a prior message from the commit master includes update data, else aborting the update operation.

[c2]

2. The method of claim 1, further comprising updating an identified one or more entries in the Fibre Channel database with the update data.

[c3]

3. The method of claim 2, wherein the Fibre Channel database comprises a zoning database.

[c4]

4. The method of claim 2, wherein the Fibre Channel database comprises a name service database.

[c5]

5. The method of claim 2, wherein the Fibre Channel database comprises a security database.

[c6]

6.The method of claim 2, wherein the Fibre Channel database comprises a management database.

[c7]

7.The method of claim 1, wherein the act of aborting comprises:

identifying which of the specified one or more devices can receive an abort message; and

sending the abort message to the identified one or more devices.

[c8]

8.The method of claim 7, wherein the act of sending the abort message comprises sending a Release Change Authorization message.

[c9]

9.The method of claim 1, wherein the act of receiving a first message comprises:

receiving an Acquire Change Authorization message; and

sending an accept message to the commit master.

[c10]

10.The method of claim 1, wherein the act of receiving a first message comprises:

receiving a Stage Fabric Configuration message; and

sending an accept message to the commit master.

[c11]

11.The method of claim 1, wherein the act of receiving a first message comprises:

receiving an Update Fabric Configuration message; and

sending an accept message to the commit master.

[c12]

12.The method of claim 1, wherein the act of receiving a first message further comprises verifying the update data received as part of the first message.

[c13]

13. The method of claim 1, wherein the act of receiving a first message comprises:

receiving a first update message from a first switch and a second update message from a second switch;

accepting one of the first or second update messages; and

rejecting the other of the first or second update messages.

[c14]

14. The method of claim 13, wherein the act accepting comprises selecting that update message having an earlier timestamp.

[c15]

15. The method of claim 13, wherein the act of rejecting comprises sending a reject message to that switch that sent the rejected update message.

[c16]

16. The method of claim 1, wherein the act of detecting the loss of the commit master comprises failing to receive a second message from the commit master within a specified time period.

[c17]

17. The method of claim 1, wherein the act of receiving a first message further comprises initiating an interval detection means and the act of detecting the loss of the commit master comprises detecting that the interval detection means has detected expiration of a specified time interval before a second message from the commit master was received.

[c18]

18. The method of claim 1, wherein the act of resending the first message comprises:

identifying which of the specified one or more devices can receive the resent message; and

resending the first message to those identified one or more devices.

[c19]

19. The method of claim 18, further comprising:

receiving a second message from one of the identified one or more devices; and

aborting the update operation specified in the resent message.

[c20]

20. The method of claim 19, wherein the act of receiving a second message from one of the identified one or more devices comprises receiving a message indicating the sending device is in a more advanced phase of the update operation.

[c21]

21. The method of claim 20, further comprising transferring control of the update operation to that device that sent the second message.

[c22]

22. A Fibre Channel switch, comprising:

a port for receiving and sending message signals;

database storage for storing at least a portion of a database;

a control unit for executing program instructions; and

storage, readable by the control means, having instructions for causing the control unit to

receive a first message from a commit master switch through the port,

detect the loss of the commit master switch, and

resend the first message through the port to each of a specified one or more Fibre Channel switches if the first message or a prior message from the commit master switch includes update data, else abort the update operation.

[c23]

23. The Fibre Channel switch of claim 22, wherein the storage further comprises instructions for causing the control means to update an identified one or more entries in the database storage with the update data.

[c24]

24. The Fibre Channel switch of claim 23, wherein the database storage comprises a zoning database.

[c25]

25.The Fibre Channel switch of claim 23, wherein the database storage comprises a name service database.

[c26]

26.The Fibre Channel switch of claim 23, wherein the database storage comprises a security database.

[c27]

27.The Fibre Channel switch of claim 23, wherein the database storage comprises a management database.

[c28]

28.The Fibre Channel switch of claim 22, wherein the instructions for causing the control means to abort comprise instructions for causing the control unit to:

identify which of the specified one or more Fibre Channel switches can receive an abort message; and

send the abort message to the identified one or more Fibre Channel switches.

[c29]

29.The Fibre Channel switch of claim 28, wherein the instructions for causing the control unit to send the abort message comprise instructions to send a Release Change Authorization message.

[c30]

30.The Fibre Channel switch of claim 22, wherein the instructions for causing the control unit to receive a first message comprise instructions to:

receive an Acquire Change Authorization message; and

send an accept message to the commit master switch through the port.

[c31]

31.The Fibre Channel switch of claim 22, wherein the instructions for causing the control unit to receive a first message comprise instructions to:

receive a Stage Fabric Configuration message; and

send an accept message to the commit master switch through the port.

[c32]

32. The Fibre Channel switch of claim 22, wherein the instructions for causing the control unit to receive a first message comprise instructions to:

receive an Update Fabric Configuration message; and

send an accept message to the commit master switch through the port.

[c33]

33. The Fibre Channel switch of claim 22, wherein the instructions for causing the control unit to receive a first message comprise instructions to:

receive a first update message from a first switch and a second update message from a second switch;

accept one of the first or second update messages; and

reject the other of the first or second update messages.

[c34]

34. The Fibre Channel switch of claim 33, wherein the instructions for causing the control unit to accept comprise instructions for causing the control unit to select that update message having an earlier timestamp.

[c35]

35. The Fibre Channel switch of claim 33, wherein instructions for causing the control unit to reject comprise instructions for causing the control unit to send a reject message through the port to that switch that sent the rejected update message.

[c36]

36. The Fibre Channel switch of claim 22, wherein the instructions for causing the control unit to detect the loss of the commit master switch comprise instructions for causing the control unit to detect the expiration of a specified time interval after receiving the first message and before receiving a second message from the commit master switch.

[c37]

37. The Fibre Channel switch of claim 22, wherein the instructions to cause the control unit to resend comprise instructions for causing the control unit to:

identify which of the specified one or more Fibre Channel switches can receive the resent message; and

resend the first message through the port to those identified one or more Fibre Channel switches.

[c38]

38. The Fibre Channel switch of claim 37, wherein the storage further comprises instructions for causing the control unit to:

receive a second message from one of the identified one or more Fibre Channel switches; and

abort the update operation specified in the resent message.

[c39]

39. The Fibre Channel switch of claim 38, wherein the instructions for causing the control unit to receive a second message from one of the identified one or more Fibre Channel switches comprise instructions for causing the control unit to receive a message indicating the sending Fibre Channel switch is in a more advanced phase of the update operation.

[c40]

40. The Fibre Channel switch of claim 39, wherein the storage unit further comprises instructions for causing the control unit to transfer control of the update operation to that device that sent the second message.

[c41]

41. A digital network comprising:

a first switch adapted to initiate a database update operation;

a second switch communicatively coupled to the first switch, the second switch having database storage, a control circuit adapted to execute instructions, and a storage readable by the control circuit and having instructions encoded therein to cause the control circuit to

receive a first message from the first switch,

detect the loss of the first switch,

resend the first message if the first message includes update data, else

abort the update operation.

[c42]

42.The digital network of claim 41, wherein the storage further comprises instructions to cause the control circuit to update a specified one or more entries a database with the update data.

[c43]

43.The digital network of claim 42, wherein the database comprises a zoning database.

[c44]

44.The digital network of claim 42, wherein the database comprises a name service database.

[c45]

45.The digital network of claim 42, wherein the database comprises a security database.

[c46]

46.The digital network of claim 42, wherein the database comprises a management database.

[c47]

47.The digital network of claim 41, wherein the instructions to abort comprise instruction to cause the control circuit to send an abort message to a plurality of other switches.

[c48]

48.The digital network of claim 47, wherein the instructions to abort comprise instructions to cause the control circuit to send a Release Change Authorization message.

[c49]

49.The digital network of claim 41, wherein the instructions to receive a first message comprise instructions to:

receive an Acquire Change Authorization message; and

send an accept message to the first switch.

[c50]

50.The digital network of claim 41, wherein the instructions to receive a first message comprise instructions to:

receive a Stage Fabric Configuration message; and

send an accept message to the first switch.

[c51]

51.The digital network of claim 50, wherein the instructions to receive a Stage Fabric Configuration message further comprise instructions to verify the update data.

[c52]

52.The digital network of claim 41, wherein the instructions to receive a first message comprise instructions to:

receive an Update Fabric Configuration message; and

send an accept message to the commit master.

[c53]

53.The digital network of claim 41, wherein the instructions to receive a first message further comprise instructions to verify the update data received as part of the first message.

[c54]

54.The digital network of claim 41, wherein the instructions to receive a first message further comprise instructions to:

receive a first update message from a third switch and a second update message from a fourth switch;

accept one of the first or second update messages; and

reject the other of the first or second update messages.

[c55]

55.The digital network of claim 54, wherein the instructions to accept comprise instructions to select that update message having an earlier timestamp.

[c56]

56.The digital network of claim 55, wherein the instructions to reject comprise instruction to send a reject message to that switch that sent the rejected update message.

[c57]

57.The digital network of claim 41, wherein the instructions to detect the loss of the first switch comprise instructions to detect failing to receive a second message from the first switch within a specified time period.

[c58]

58.The digital network of claim 41, wherein the instructions to receive a first message further comprise instructions to initiate a timer and the instructions to detect the loss of the first switch comprise instructions to detect that the timer expired before a second message from the first switch was received.

[c59]

59.The digital network of claim 41, wherein the instructions further comprise instructions to:

receive a second message from a third switch, and

abort the update operation specified in the resent message.

[c60]

60.The digital network of claim 59, wherein the instructions to receive a second message from a third switch comprise instructions to receive a message from the third switch that indicates the third switch is in a more advanced phase of the update operation.

[c61]

61.The digital network of claim 60, wherein the instructions to receive a second message from a third switch further comprise instructions to transfer control of the update operation to the third switch.